CLAIMS

We claim:

1. A device for performing numerical value conversion of a digital input value in a first unit to a second unit being a natural unit, the first unit being related to the second unit by a first equation, the digital input value being a digitized value of a first measurement parameter among a plurality of measurement parameters, the device comprising:

a look-up table storing a plurality of coefficients for performing the numerical value conversion from the first unit to the second unit for each of the plurality of measurement parameters, the look-up table being indexed using a first parameter to provide a selected coefficient, the first parameter being indicative of the first measurement parameter;

an arithmetic logic unit receiving the digital input value in the first unit and the selected coefficient from the look-up table, the arithmetic logic unit performing the numerical value conversion based on the first equation and using the selected coefficient to compute a digital output value in the second unit; and

a saturation-limit circuit coupled to receive the digital output value in the second unit from the arithmetic logic unit and provide a predetermined final output value when the digital output value exceeds a predetermined minimum or maximum value.

2. The device of claim 1, wherein the saturation-limit circuit provides a first predetermined final output value when the digital output value exceeds a predetermined maximum value

and provides a second predetermined final output value when the digital output value is below a predetermined minimum value.

3. The device of claim 2, wherein the digital output value comprises values between a maximum output value and a minimum output value, the first predetermined final output value being the maximum output value and the second predetermined final output value being the minimum output value.

4. The device of claim 3, wherein the second predetermined final output value is zero.

5. The device of claim 1, wherein the arithmetic logic unit comprises a fixed-function arithmetic logic unit capable of performing only multiplication and addition operations.

6. The device of claim 1, wherein the first unit comprises an arbitrary unit and the second unit comprises a natural unit of physical measurement.

7. The device of claim 6, wherein the numerical value conversion from the arbitrary unit to the natural unit has a linear relationship described by the equation $D_N = m\ D_A + c$, where D_A is the digital input value, D_N is the digital output value, m is a slope coefficient and c is an offset coefficient, and the plurality of coefficients comprises a plurality of coefficient pairs for each of the plurality of measurement parameters, each coefficient pair comprising a slope coefficient and an offset coefficient.

8. The device of claim 6, wherein the numerical value conversion for the selected measurement parameter from the arbitrary unit to the natural unit has a non-linear relationship

and the plurality of coefficients comprises a first set of coefficients for the selected measurement parameter, the first set of coefficients implementing the numerical value conversion in a piecewise-linear fashion approximating the non-linear relationship.

9. The device of claim 8, wherein the first set of coefficients comprises coefficients for a plurality of linear segments for performing the piecewise-linear numerical value conversion, each linear segment being described by the equation $D_N = m\ D_A + c$, where D_A is the digital input value, D_N is the digital output value, m is a slope coefficient and c is an offset coefficient for the respective linear segment, and the first set of coefficients comprises a plurality of coefficient pairs, each coefficient pair comprising a slope coefficient and an offset coefficient for the respective linear segment.

10. The device of claim 9, wherein the digital input value comprises an N-bit digital value and the first parameter comprises the most significant k bits of the digital input value where k is less than N.

11. The device of claim 1, wherein the digital input value comprises a first digital input value of a first bit length and a second digital input value of a second bit length different than the first bit length.

12. A method for performing numerical value conversion of a digital input value in a first unit to a second unit being a natural unit, the first unit being related to the second unit by a first equation, the digital input value being a digitized value

of a first measurement parameter among a plurality of measurement parameters, the method comprising:

storing a plurality of coefficients in a look-up table for performing the numerical value conversion from the first unit to the second unit, each of the plurality of measurement parameters being associated with at least one of the plurality of coefficients;

indexing the look-up table using a first parameter being indicative of the first measurement parameter to provide a selected coefficient;

providing the digital input value and the selected coefficient to an arithmetic logic unit;

performing a numerical value conversion at the arithmetic logic unit based on the first equation and using the selected coefficient to compute a digital output value in the second unit from the digital input value in the first unit;

determining if the digital output value exceeds a predetermined maximum value;

providing a first predetermined value as the final output value when the digital output value exceeds the predetermined maximum value; and

providing the digital output value as the final output value when the digital output value does not exceed the predetermined maximum value.

13. The method of claim 12, further comprising:

determining if the digital output value is less than a predetermined minimum value;

providing a second predetermined value as the final output value when the digital output value is less than the predetermined minimum value; and

providing the digital output value as the final output value when the digital output value exceeds the predetermined minimum value.

14. The method of claim 12, wherein the digital output value comprises values between a maximum output value and a minimum output value, the first predetermined value being the maximum output value and the second predetermined value being the minimum output value.

15. The method of claim 12, wherein providing the digital input value and the selected coefficient to an arithmetic logic unit comprises:

providing the digital input value and the selected coefficient to a fixed-function arithmetic logic unit capable of performing only multiplication and addition operations.

16. The method of claim 12, wherein the digital input value comprises a first digital input value of a first bit length and a second digital input value of a second bit length different than the first bit length.

17. The method of claim 12, wherein storing a plurality of coefficients in a look-up table for performing the numerical value conversion from the first unit to the second unit comprises:

storing a plurality of coefficients in the look-up table wherein the numerical value conversion from the

arbitrary unit to the natural unit has a linear relationship described by the equation $D_N = m\ D_A + c$, where D_A is the digital input value, D_N is the digital output value, m is a slope coefficient and c is an offset coefficient, and the plurality of coefficients comprises a plurality of coefficient pairs for each of the plurality of measurement parameters, each coefficient pair comprising a slope coefficient and an offset coefficient.

18. The method of claim 12, wherein storing a plurality of coefficients in a look-up table for performing the numerical value conversion from the first unit to the second unit comprises:

storing a plurality of coefficients in the look-up table wherein the numerical value conversion from the arbitrary unit to the natural unit has a non-linear relationship and the plurality of coefficients comprises a first set of coefficients for the selected measurement parameter, the first set of coefficients implementing the numerical value conversion in a piecewise-linear fashion approximating the non-linear relationship.

19. The method of claim 18, wherein the first set of coefficients comprises coefficients for a plurality of linear segments for performing the piecewise-linear numerical value conversion, each linear segment being described by the equation $D_N = m\ D_A + c$, where D_A is the digital input value, D_N is the digital output value, m is a slope coefficient and c is an offset coefficient for the respective linear segment, and the first set of coefficients comprises a plurality of coefficient pairs, each

coefficient pair comprising a slope coefficient and an offset coefficient for the respective linear segment.

20. The method of claim 12, wherein the digital input value comprises an N-bit digital value and the first parameter comprises the most significant k bits of the digital input value where k is less than N.